The book is sponsored by the Object Management Group, which is a worldwide standards group comprised of over 600 hardware and software companies (*e.g.*, IBM, HP, Sun, Novell) that was founded in 1989. In the book (page 8), the authors state, "[s]tudy after study shows that most information systems organizations spend 80% of their time and effort maintaining existing systems, leaving precious little time to develop new systems."

Q. How is the subject of the fifth source, object technology, particularly relevant to the case at hand?

A. Object-oriented technology is the state-of-the-art in software technology. It enjoys widespread use throughout the entire information technology community and is widely deployed throughout the telecommunications industry. In fact, the sponsor of the book previously mentioned (Object Management Group) also published a book in 1996 entitled *The Object Technology Casebook*, by Paul Harmon and William Morrissey (Wiley Computer Publishing), which highlights real-life case studies of object-based applications. Of the three examples discussed in the book's section on object technology and distributed systems, one is for a system used by repair center staff to diagnose and solve customer-reported phone service complaints for a telecommunications company in Canada.

In addition, in the book's section on object technology and cost effectiveness, one of the five applications discussed is for a third-party billing system designed and implemented by Pacific Bell.

Q. Describe how Verizon VA analyzed this supporting information.

A. Verizon VA calculated the relationship of maintenance to total expense for each source. The results for Dr. Engle's data show that the annual ongoing system maintenance factor which is to be applied to the development and implementation costs of software would average somewhere in the range of 25% to 67% per year. Similarly, SEI's data translate into an annual systems maintenance factor in the range between 17% and 39%. Likewise, Dr. Lawlis' data reflect a range of 33% to 67% per year, while Dr. Salisbury's data yield a range between 39% and 67% per year. Finally, the data in the book by Michael Guttman yield a value of 67% per year. (The calculations, based on the data from these five sources, for the percentage of software costs attributable to maintenance are presented in VZ-VA CS, Vol. VIII, Part F-5, Workpaper 4, Pages 8-12.) It is important to note that the findings of the experts and researchers discuss software maintenance costs as a function of the total life cycle cost of the software, not as a function of the investments in the computer equipment which runs the software. Thus, a factor applied to the cost of development is a more meaningful estimator of software

maintenance costs than a factor applied to general purpose computer hardware investments. These analyses, and the supporting data from the OMG literature demonstrate that the 15% factor is a reasonable and conservative estimate of the forward-looking software maintenance costs.

Q. Did Verizon calculate any other ongoing costs?

A. Yes. The Common Overhead and Gross Revenue Loading ACFs, as described elsewhere in this testimony, were applied to both the annual costs associated with the general purpose computer investments and the estimated annual software maintenance costs.

G. SUMMARY OF COST STUDY RESULTS

Q. Please summarize the results of the study.

A. The following chart summarizes several of the key items:

Item	Amount
L1. One-Time Development Costs for which Recovery is being sought	$226,940 K
L2. Amortized and Adjusted Development Costs (L1) per Year	$37,622 K
L3. Annual Recurring Costs associated with UNE	$49,874 K
L4. Annual Costs (L2 + L3)	$87,496 K
L5. Virginia's Share of Annual Costs on Basis of Access Lines	$8,805 K
L6. Monthly Per Resold Line/Unbundled Loop/ UNE-P/Combination During 10-year recovery period	$0.84
L7. Monthly Per Resold Line/Unbundled Loop/ UNE-P/Combination After 10-Year recovery period	$0.47

H. SUMMARY OF RATES

Q. Please summarize how the proposed OSS rates were computed.

A. First, as discussed above, the initial development costs were separated from the ongoing costs. Then, the development costs and ongoing costs were separated into specific Verizon East – South costs and general Verizon East costs.

Next, the specific Verizon East – South development costs were divided by the levelized number of resold lines and UNE loops and platform/combinations for Verizon East – South. This results in a cost of $0.19 per month per resold line/UNE loop/UNE platform, representing the Verizon East - South component of the recurring recovery charge.

Then, the specific Verizon East – South ongoing costs were divided by the levelized number of resold lines and UNE loops and platform/combinations for Verizon East – South. This results in a cost of $0.21 per month, representing the Verizon East – South component of the recurring ongoing charge. The Verizon East – South recurring recovery charge and the Verizon East - South recurring ongoing charge were added together, resulting in a Verizon East – South component charge of $0.40 per month per resold line/UNE loop/UNE platform.

Next, the general Verizon East development costs were divided by the levelized number of resold lines and UNE loops and platform/combinations for the entire Verizon East Footprint. This results in a cost of $0.18 per month, representing the Verizon East component of the recurring recovery charge. Then, the general Verizon East ongoing costs were divided by the levelized number of forecasted resold lines and UNE loops and platform/combinations for the entire Verizon East footprint. This results in a cost of $0.26 per month, representing the Verizon East component of the recurring ongoing charge. The Verizon East recurring recovery charge and the Verizon East recurring ongoing charge were added together. This results in the general Verizon East component charge of $0.44 per month per resold line/UNE loop/UNE platform.

The total monthly charge is then a combination of the Verizon East – South charge ($0.40) and the Verizon East charge ($0.44), or $0.84 per resold line/UNE loop/UNE platform.

Q. What happens at the end of the 10-year recovery period?

A. After 10 years, Verizon should have recovered the initial development cost, and thus the recurring recovery charge (both the specific Verizon East – South as well as the general Verizon East components) should be eliminated. Then, the total monthly charge would simply be the addition of the specific

Verizon East - South recurring ongoing charge of $0.21 and the general Verizon East recurring ongoing charge of $0.26, producing a total charge of $0.47 per month per UNE loop, platform/combination or resold line.

Q. How do these calculations take into account the fact that demand will not be constant over time?

A. As previously discussed, the initial development costs associated with the Access to OSS is amortized over 10 years. To match this time period, all rates must be levelized. That is, the demand used in calculating a ratio of cost to demand will be the levelized demand. This approach will smooth out any rate anomalies that might otherwise be created from increased demand during the recovery period. This calculation is displayed in VZ-VA CS, Vol. VIII, Part F-5, Workpaper 4, page 13 of the attached study. Levelized rates provide certainty and consistency to CLECs even though Verizon VA may not be compensated adequately in the earlier years. This method spreads the cost of entry over a significant period of time for the CLECs.

Q. Please describe the calculation of levelized demand.

A. To levelize the demand, Verizon VA employed a time value approach consistent with how costs were amortized. Specifically, all of the demand in a given year is considered to occur at the midpoint of that year. Then a

present value of that future forecasted demand factor is applied to bring that demand to an equivalent January 1, 2001 timeframe. Finally, an Annuity from a Present Amount factor is applied to levelize the demand over the 10-year period.

Q. Which workpapers show the rate calculations?

A. The calculations are displayed in VZ-VA CS, Vol. VIII, Part F-5.

Q. Please summarize the rate proposal for the Access to OSS costs proposed by Verizon VA.

A. The proposed rates are summarized in the following table:

CATEGORY	During 10 Year Period	After 10 Year Period
Verizon East – South Component	$0.40	$0.21
Verizon East Component	$0.44	$0.26
Total VA monthly charge per UNE Loop, Platform/Combination and Resold line in service	$0.84	$0.47

XII. NON-RECURRING COSTS
(JDPL Issues II-1-a; II-2 to II-2-d; IV-30; IV-36)

Q. What is the purpose of the NRC section of the testimony?

A. This section explains the analyses conducted by Verizon VA of the non-recurring costs it incurs to provide UNEs to CLECs.

Q. What are non-recurring costs?

A. Non-recurring costs are those associated with the one-time activities necessary to process and provision CLECs' requests for the initiation, change, or disconnection (termination) of service, or for other one-time services related to UNEs provided by Verizon to CLECs. The costs generally fall into four primary categories: (1) service order; (2) central office wiring; (3) provisioning; and (4) field installation.

Non-recurring costs, unlike recurring costs, are incurred in response to a specific event by a specific cost causer, and involve easily identifiable, concrete costs. The most efficient and concrete means of recovery accordingly is to charge the cost causer for those costs. Spreading such a directly identifiable expense over a general class of UNEs, ordered over time (as would be the case if the costs were recovered through recurring rates), would be both less direct and far less efficient, especially if estimates of future usage prove high (or low).

A. THE NON-RECURRING COST MODEL

Q. How has Verizon calculated its non-recurring costs?

A. Verizon has developed a non-recurring cost model to standardize the presentation of non-recurring cost calculations throughout all Verizon regulatory jurisdictions, and has submitted that study in this proceeding. VZ-VA CS, Vol. XI, Part H of Verizon's July 2 cost studies provides material in support of the non-recurring cost studies.[9]

Q. Please describe that non-recurring cost model.

A. The non-recurring cost model reflects a bottom-up calculation that is designed to measure each cost arising in connection with servicing individual CLEC requests for UNEs and related services. A complete list of UNEs and services for which costs are developed can be found in VZ-VA CS, Vol. XI,

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[9] Part H consists of 13 sections: Section A - Description of Non-recurring Cost Model Methodology; Section B - List of UNEs and Services Contained in the Non-recurring Cost Model; Section C - Description of Functional Organizations; Section D - List of Work Activities Performed within each Functional Organization; Section E - Labor Rates used in the Functional Organizations; Section F - Input Factors; Section G - Sample Model Output: Tab 1 - Two Wire New Initial Link; Section H - Model Cost Summary; Section I - Summary of Non-recurring Rates; Section J - Letter to Department Heads; Section K - Instructions to Work Time Survey Respondents; Section L - Instructions to Panel of Experts; Section M - Non-recurring Work Activities Survey Review of Typical Occurrence and Forward-Looking Adjustment Factors.

Part H, Section B. The model identifies all of the activities involved in fulfilling such requests, organized by the functional organization within Verizon that performs each activity. A list of the functional organizations (and their respective acronyms) whose activities were studied by Verizon in preparing the NRC model can be found in VZ-VA CS, Vol. XI, Part H, Section C. A list of the work activities performed within each functional organization is provided in VZ-VA CS, Vol. XI, Part H, Section D.

Verizon employs a survey process, discussed further below, in order to determine the average amount of time required to perform each activity. These times are adjusted through the application of several factors, also explained below, to reflect work times in a forward-looking environment. These "forward-looking" work activity times are multiplied by the appropriate labor rates, in order to calculate the total non-recurring costs.

Q. Are Verizon's non-recurring cost studies forward-looking?

A. Yes. The non-recurring cost studies have taken into account all anticipated efficiencies over the three-year planning period resulting from the deployment of forward-looking technology. In conducting the studies, we made every effort to identify only productive work times; eliminate those tasks that are required today, but that should be unnecessary in the foreseeable future as a result of process improvements or system

enhancements over the planning period; and reflect the savings due to projected system improvements and methods, including the ongoing effects of the learning curve. Indeed, Verizon's studies reflect an extremely optimistic view regarding the potential benefits from future technologies and learned efficiencies.

Q. How are forward-looking non-recurring costs classified in the non-recurring cost model?

A. The forward-looking non-recurring costs are classified into the following four cost categories:

(1) **Service Order** – Includes the costs related to work activities required to process a CLEC's request for service in the Telecom Industry Services Operations Center (TISOC) organization (recently renamed the National Market Center, or NMC, but still referred to as the TISOC in the cost study materials, and thus in this testimony as well);

(2) **Central Office Wiring** – Includes the work activity related costs to perform the necessary function(s) in the CO Frame work group to satisfy a CLEC service requests;

(3) **Provisioning** – Includes the work-activity-related costs incurred by any of the remaining Verizon support work groups during the provisioning process. Examples include the Regional CLEC

Coordination Center (RCCC), Recent Change Memory Administration Center (RCMAC), and the Mechanized Loop Assignment Center (MLAC); and

(4) **Field Installation** – Includes the work-activity-related costs incurred by Verizon VA as a result of work performed in the outside plant by technicians dispatched to install service requested by a CLEC.

Q. Has Verizon submitted the NRC model, or one like it, in § 252 proceedings in other states?

A. Yes. The studies and presentation submitted here are essentially the same as those recently submitted in New York, Massachusetts, Maryland, New Jersey, Delaware, and Washington, D.C. Verizon has continued to refine and update the model and the data inputs to keep them current, reflect efficiency gains, and make them more relevant relative to the economic concept upon which the recovery of forward-looking costs should be based.

B. COST CALCULATION WITHIN THE MODEL

Q. Please explain the steps used to calculate forward-looking costs in the NRC model.

A. As summarized above, and detailed in VZ-VA CS, Vol. XI, Part H, Section A, Verizon VA's model converts work times to costs. This is done through the following steps:

(1) Identify and map the non-recurring connect- and disconnect-related work activities required to provision UNEs.

(2) Determine the average amount of work time required to perform the work activities today.

(3) Apply a "Typical Occurrence Factor" (the frequency, in percentage terms, with which an activity is performed currently for a given UNE) to the estimate of the average work time. This produces total time (in minutes) consumed today to perform the work.

(4) Apply a "Forward-Looking Adjustment Factor" (the frequency, in percentage terms, with which an activity is expected to be performed, if at all, for a given UNE in the forward-looking three-year planning period, and the amount of time expected to perform the activity) to the time identified in Step 3 to produce forward-looking work time (in minutes) required in the future.

(5) Multiply the forward-looking connect and disconnect work times (in minutes) in Step 4 by a directly assigned forward-looking labor rate per minute[10] to yield the forward-looking direct costs.

(6) Multiply the forward-looking disconnect costs by a Present Worth Factor to reduce the forward-looking disconnect cost to its present value.[11]

(7) Add the forward-looking connect costs to the present worth value of the disconnect cost.

(8) Multiply the total costs in Step 7 by the Common Overhead Factor to apportion common overhead expense to the direct non-recurring cost.[12]

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[10] Labor rates are based on the employee's job function code. The rates are based on a base year and trended forward and levelized over three years. The Labor Trend Factor is 1.04. The factor is based on Verizon's estimate of management and non-management annual salary increases.

[11] The model uses a Cost of Money factor of 12.95%, which is explained in the separate testimony of Dr. Vander Weide. The Cost of Money is used to calculate the Present Worth Factors and the Annuity Factor. The Present Worth Factors are used to discount disconnect costs and the Annuity Factor is used to levelize the labor rates.

[12] A Common Overhead Factor of 1.0886 is applied to each non-recurring cost, as explained above in the ACF section of this testimony. The Common Overhead Factor does not include any labor expenses from the functional organizations that are directly assigned to non-recurring costs.

(9) Assign to the direct plus common costs an allocation of Gross Revenue Loading (GRL) by multiplying the costs identified in Step 8 by the GRL Factor.[13]

(10) The model addresses the application, where appropriate, of Aerial/Underground Weighting Factors to the Bridged Tap and Load Coil Removal DSL Conditioning costs.

(11) The model applies UDLC and Copper/IDLC Weighting Factors to the Two-Wire Analog-Digital UNE-P New CO Wiring and Provisioning costs (Tabs 36 and 37).

The costs are determined both for a normal or standard interval[14] and for an expedited interval.[15] The resulting costs, for both standard and expedited intervals, are contained in VZ-VA CS, Vol. XI, Part H, Section H.

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[13] A Gross Revenue Loading Factor of 1.0067 is also applied to recover an appropriate portion of uncollectibles and regulatory assessment fees. The application of the above factors is described in more detail in VZ-VA CS, Vol. XI, Part H, Section A.

[14] A standard interval is the time between service ordering and service provisioning, based on normal work schedules. Standard intervals are developed based on the type and/or complexity of the service ordered, the volume of work, and the resources required and available to perform the work.

[15] An expedited interval is the time between service ordering and service provisioning, based on a request to advance a service order. CLECs requesting expedited service (*i.e.*, service provisioned sooner than the standard interval) would cause Verizon VA to shift its workload, in order to accommodate such a request.

(Continued . . .)

C. FORWARD-LOOKING ACTIVITY TIMES

Q. How were the activities included in the NRC model determined?

A. The model contains the activities performed in each functional organization associated with the ordering and provisioning of Verizon UNEs and related services to requesting CLECs. The list of activities was developed based on input from the appropriate work center personnel who are engaged in the day-to-day work flow activities needed to satisfy CLEC UNE and related service orders. This process was designed to identify a comprehensive list of the individual work steps that are or may be involved in fulfilling such requests.

Q. Describe Verizon's functional organizations and how they interact to respond to a request for service by a CLEC.

A. There are 27 functional organizations involved in ordering and provisioning UNEs and services to CLECs, shown in VZ-VA CS, Vol. XI, Part H, Section

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(Footnote continued)

Thus, the CLEC request for expedited service would have to be worked outside of the normal work shifts or other work would have to be moved outside of the normal work shifts. Non-management employees working outside of the normal work shifts are paid a premium wage rate. The non-recurring costs for an expedited request recognize the cost consequences of paying for labor at a premium wage rate.

C. Increases in the number and types of UNE and related services provided to CLECs have contributed to an increase in the number of functional organizations handling service orders and provisioning. The work flow activities performed in each organization are described in VZ-VA CS, Vol. XI, Part H, Section D. For example, there are 38 activities listed for the RCCC, which is charged with primary responsibility for coordinating the provisioning of UNE requests.

All these functional organizations interact to provide a given UNE or service. For instance, five functional organizations are involved with the ordering, central office wiring, provisioning and field installation for a new two-wire loop (see VZ-VA CS, Vol. XI, Part H, Section G). Specifically, they are:

(1) the TISOC, which is the initial point of contact for the CLEC and which facilitates service order processing;

(2) the RCCC, which, as noted above, coordinates Verizon and CLEC activities;

(3) the MLAC, which handles requests for manual assistance (RMAs) on orders that should be processed electronically but "fall out" of the automated process;

(4) the CO Frame, which is responsible for making cross-connections between Verizon and the CLEC or between the CLEC and CLEC facilities in the Verizon Central Office; and

(5) Field Installation, which handles manual connections to outside plant facilities, as necessary.

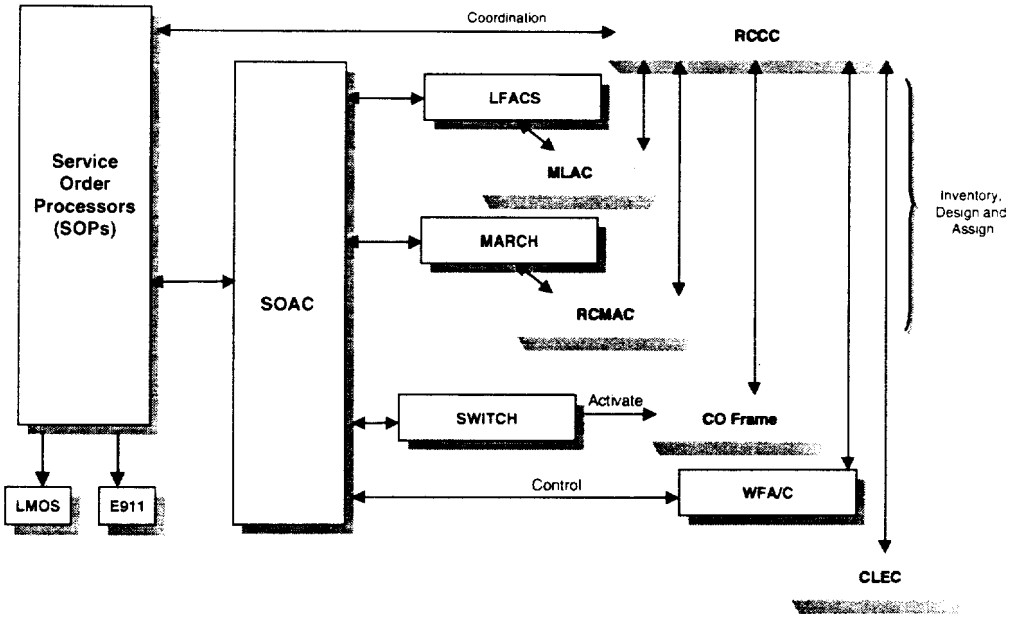
Q. Provide a specific example of an activity requested by a CLEC and the functional organizations that would be involved in performing that activity.

A. One example of a CLEC request that results in non-recurring work activities is a "hotcut," or coordinated cutover. A hotcut is the transfer of an existing Verizon VA end user customer to a CLEC that is performed at the option of the CLEC to minimize service disruption for the end-user customer. In a hotcut scenario, various functional organizations may perform work for which non-recurring costs are incurred, but it is the RCCC that ensures that all work is accomplished in a timely and accurate manner. The RCCC enables nearly simultaneous disconnection of a loop and/or port from Verizon VA and connection with the CLEC's facilities. Technicians from the CO Frame functional organization coordinate with the CLEC through the RCCC to ensure an interruption-free flashcut. The RCMAC performs the changes to the switch memory that facilitate the cutover to the CLEC switch

without a loss of service. Figure 8 below is a diagram that represents a more complete description of the organizations that may be involved in processing a hotcut.

Figure 8

Provisioning Process Flow for a Hotcut



Shaded areas represent where manual work is performed either because of the normal work process flow or due to fallout

LFACS	Loop Facility Assignment and Control System
LMOS	Loop Maintenance Operations System
MLAC	Mechanized Loop Administration Center
MARCH	Memory Administration Recent Change History
RCMAC	Recent Change Memory Administration Center
SOAC	Service Order Analysis and Control
WFA	Work Force Administration System

Q. Is there any other evidence of the quality with which work functions have been developed and implemented in order to produce an efficient process?

A. In the fall of 2000, the documented processes identified for the RCCC were ISO-9000 certified, ensuring that the processes are "quality controlled," accurate, and up-to-date, using a robust documentation regimen. ISO-9000 certification (an international quality standard) was granted only after a team of ISO auditors examined every aspect of the RCCC documented processes. The processes were reviewed again and recertified in the spring of 2001.

Q. Please explain how forward-looking activity times were developed.

A. As noted above and discussed below in more detail, average current work times were adjusted to reflect future operating conditions assuming improvements in productivity and enhancements to OSS resulting in reduced work times and/or increased electronic "flowthrough" in Verizon's automated systems. While work functions and work times associated with those functions were first analyzed for current operations, these functions and times served only as a baseline for the forward-looking analysis. Work functions and work times were then adjusted, as appropriate, to fully reflect the benefits of future mechanization by Verizon VA, as well as other improvements in processes and productivity.

Q. Why is the use of current average work times a reasonable starting point for estimating forward-looking costs?

A. Current average work times are a reasonable starting point for estimating forward-looking costs because the current average times are known and measurable. The expert personnel from whom the work time estimates were obtained were explicitly instructed to provide estimates that reflected only the productive time required to perform a particular work task.

Q. How were current average work times determined?

A. Verizon VA's non-recurring cost model is based on a rigorous survey of personnel actually involved in the relevant work functions under study. Further detail about the conduct of the survey is set forth below. Verizon cost analysts reviewed the activity work time estimates submitted by each respondent to remove outliers and to ensure that the studies were adequately documented. The initial review process was conducted under the guidance of a Verizon statistician. As detailed below, consultants from NERA also reviewed the survey results.

Variations on this approach included the use of existing work time analyses performed for Verizon (with respect to the TISOC) by an outside

consultant (Andersen Consulting) and the use of a monthly productivity report (for the MLAC).

Q. Please describe the survey process.

A. Verizon Service Cost personnel used process workflows to develop surveys to determine the time required to complete various work activities. Verizon Operations Assurance and Administration and Product Management personnel reviewed the surveys to ensure that the most up-to-date work process activities were included. The surveys were then administered to the field organizations responsible for the ordering and provisioning of wholesale service.

Verizon distributed surveys throughout the region to those associates and management employees most familiar with ordering and provisioning services for Verizon's CLEC customers. The head of each identified work group was informed in writing (see VZ-VA CS, Vol. XI, Part H, Section J) of the purpose and importance of the survey and the need for accuracy.

In addition to management oversight of the process, instruction forms (see VZ-VA CS, Vol. XI, Part H, Section K) were given to each survey participant. These forms provided the necessary instructions and reinforced the importance of the undertaking and the need for independent and accurate reporting.

The Service Cost staff monitored survey results to ensure collection of the surveys from respondents in all work groups. Substantial efforts were made to convey the importance of the process and the need for employee response. Once the field personnel completed the surveys, a panel of 15 subject matter experts familiar with the processes involved analyzed the data for reasonableness.[16] The results were then validated for statistical accuracy.

Q. Were the average work times produced by the surveys adjusted to be forward-looking?

A. Yes. Those adjustments are discussed after the discussion of the TISOC and MLAC work times.

Q. You said the surveys did not cover the TISOC and MLAC work times. How were work times verified for the TISOC?

A. Andersen Consulting (now "Accenture") was engaged by Verizon to conduct a work-time analysis for the TISOC organization. Verizon relied on that analysis in identifying appropriate TISOC staffing levels. While most non-

[16] The data was first analyzed, more than 18 months ago, by a panel of 19 subject matter experts. In June 2001, the data was validated by a panel of 15 subject matter experts.

recurring cost studies were based on surveys of time estimates for work activities, the Andersen Consulting analysis was based on actual observations of order processing work in New York and Boston. The Andersen Consulting analysis included observations of the processing of over 800 service orders between March and August 1999. The results were then validated by more than 25 service representatives and their supervisors in the TISOC.

Q. Is the Andersen Consulting analysis of the work activities in New York and Boston valid for other jurisdictions?

A. Yes. Since the TISOCs are regional centers whose jurisdictions are not limited to any particular states, study observations in New York and Boston are valid for all the six TISOCs, which are located in Boston, Massachusetts; Falls Church, Virginia; New York, New York; Newark, New Jersey; Pittsburgh, Pennsylvania; and Silver Spring, Maryland.

Q. Was the Andersen Consulting TISOC work-time analysis adjusted to be forward-looking?

A. Yes. Verizon has assumed that there will be future advances in OSS electronic interfaces and productivity that will reduce the TISOC work times. The Andersen Consulting results were adjusted downward through the use of

forward-looking adjustment factors in the non-recurring cost model to reflect forward-looking expectations.

Q. How were work activity times verified for the MLAC?

A. The MLAC productivity report tracks the total number of requests for manual assignment and the hours worked on them on a monthly basis in that functional organization. The number of requests for manual assignments handled over a specific period of time in the MLAC can be calculated from this report. The time to process a request for manual assignments is the average time it takes an assignment clerk to assign cables and pairs per line for those orders that cannot flow through the mechanized provisioning systems. MLAC activities required in the future are not expected to change. However, in recognition of expected improvements in electronic flowthrough of orders, dramatic downward adjustments, reflecting a reduction in the number of occurrences when MLAC manual activities are necessary, were incorporated in the non-recurring cost model. An optimistic estimate of 96% order flowthrough was incorporated, so that only 4% of the identified MLAC costs for manual cable and pair assignments are incorporated in the non-recurring cost model results. This reflects a level of flowthrough far better than is actually achievable today. The study's incorporation of improved